BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF HAWAII

In the Matter of the Application of	)	
	)	
HAWAII ELECTRIC LIGHT COMPANY, INC.	)	Docket No. 05-0315
	)	
For Approval of Rate Increases and Revised Rate Schedules and Rules.	)	
	)	

HELCO
VOLUMINOUS RESPONSES TO
CONSUMER ADVOCATE
INFORMATION REQUESTS

BOOK 9 OF 15

January 12, 2007

CA-IR-50

Ref: HELCO T-5, page 37 – Alternative Fuel Additives.

a. Please provide complete copies of all economic studies performed by or for HELCO to determine that the described fuel additive utilization is cost effective.

b. State with specificity where the scheduled outage reduction savings from this measure is reflected within HELCO's proposed test year O&M estimates.

HELCO Response:

a. Attached as pages 3 and 4 of this response are pages 5 and 6 of a 2005 study performed by COEN. (The remainder of the COEN study is confidential and will be provided pursuant to Protective Order No. 22593, dated June 30, 2006. Because the requested information is voluminous, it is available for inspection at HECO's Regulatory Affairs Division office, Suite 1301, Central Pacific Plaza, 220 South King Street, Honolulu, Hawaii. Please contact Dean Matsuura at 543-4622 to make arrangements to inspect the requested information. See confidential and voluminous Attachment 1.) COEN is a combustion control consulting firm from California, which concluded that significant savings could be achieved by switching from the current calcium based additive to one based on magnesium. One of the more significant line items in the study (see page 6 of the COEN study attached as page 4 of this response) estimated a $292,512 cost savings by not having to shut down our base loaded steam units as often to clean the boilers. This cost estimate was based on the higher cost incurred to replace the power output from the shut down steam unit, with power produced by one of the intermediate combustion turbine generators. The actual cost incurred would be dependent upon the difference between industrial fuel oil and diesel fuel at the time of the outage, as well as on what generating units are available to replace the steam unit output. The cost differential between the industrial fuel oil used by the base loaded steam units, and

the diesel fuel oil used at the intermediate combustion turbines, has increased, which would increase the cost benefit of avoiding the shut down. With the previous LO-1 additive, these units were taken off line at intervals as short as 10 to 12 weeks to clean the boilers to maintain opacity within the allowable limits of the respective Covered Source Permits ("CSP's").

b. The HELCO Proposed test year O&M estimates are based on the Overhaul Schedule 2006 dated 11/18/05 (HELCO-527). There are no boiler washes scheduled. Page 5 of this response shows the HELCO 2003 Overhaul Schedule (End of Year...Rev 1/24/04 by DYM) which lists the actual dates of all major outages. There were several boiler washes performed in 2003 on the steam units outside of their normal annual overhauls. The 2006 test year O&M estimates assume no special boiler washes.

a grayish white, making it difficult to distinguish the plume from the sky background. Opacity levels at Hill during this period were within regulatory limits, although marginal at times. Typically, opacity consistently was estimated in a range of 15%, ± 5% during the demonstration. Previously, plume opacity following a wash increased over time and after ≈ 3 months the unit was forced to come off line to wash in order to prevent an opacity violation. At Puna, typical readings of plume opacity ranged from 15 – 25%.

At Hill 6, after approximately 6 months of operation with 8263, the unit was taken off line for its annual maintenance outage. Prior to the wash, a boiler inspection was conducted to document boiler appearance and ash deposit characteristics. In general, tube deposits were found to be light, and the material friable and easy to remove. Analysis of deposit samples showed that the deposits in the furnace were primarily magnesium compounds (magnesium oxide, magnesium silicate), while those on the pendant tubes were primarily sulfur and magnesium compounds (magnesium sulfate, magnesium vanadate). The presence of magnesium sulfate and vanadate compounds is evidence that, to some degree, the 8263 is tying up sulfur and vanadium, both of which are desirable. With 8263, station personnel reported that more ash deposits were found during an annual inspection at the bottom of the stack than with LO-1. Evidence of cleaner boiler/air heater conditions was also provided by monitoring air heater gas inlet temperatures and pressures during this period. At Hill, these temperatures and pressures were unchanged from clean boiler values. The pH of the furnace deposits was 9.2, while the pendant deposits were 7.2. At Puna, over the 6 month period gas temperatures upstream of the air heater gradually increased, but remained lower than those seen with dirty boiler conditions.

At Puna, after nearly 7 months of operation the unit was also taken off line for its annual maintenance outage and a similar boiler inspection was conducted. Boiler condition and ash deposit physical characteristics were similar to those noted at Hill. The ash hoppers at Puna were very full of material, not having been cleaned for 7 months. The ash in the hoppers was reported by station personnel as "fine, both easier to remove and not as black" as that noted before use of the 8263.

An economic analysis was done to compare the costs at Hill and Puna of operating with 8263 to costs of operating with LO-1. The cost elements considered included:

1. Replacement power costs for forced outages to wash boilers necessitated by opacity problems (4 boiler washes per year with LO-1, 2 washes per year with 8263).

2. Cost of washing the boilers and air heaters.

3. Cost of cleaning the Puna ash hoppers and Hill 6 stack.

4. Depreciated capital cost of the waste water treatment system required to treat the wash water (apportioned to units by the amount of waste water used for each unit with LO-1 and 8263).

5. Cost of each additive

6. Heat rate penalty at Hill 6 for higher O_2 operation to control PM.

The annual cost differential between using 8263 and LO-1 at Hill 6 and Puna is summarized below.

Cost Element	Cost With 8263	Cost With LO-1	Cost Differential (8262 – LO-1)
1. Replacement Power	$292,512	$585,024	- $292,512
2. Washing	$19,250	$36,250	- $17,000
3. Clean Puna Hoppers and Hill Stack	$8,000	$8,000	0
4. Depreciated Capital Cost of Treatment System	$38,100	$46,140	- $8,040
5. Additive Cost	$156,768	$184,326	- $27,558
6. Hill 6 Heat Rate Penalty	$50,000	0	+ $50,000
Totals	**$564,630**	**$859,740**	**- $295,110**

If Hill 6 and Puna could operate with only one outage a year, the cost differential with 8263 would improve by an additional $146,256 to $441,366.

Based on the results described above, the following conclusions are presented:

1. While operating with LO-1 both units routinely required an outage every ≈ 3 months to wash so as not to exceed opacity regulatory requirements. The ash pH with this additive was very acidic, in the 1 to 3 range at Hill 6 and 2 - 4 at Puna. The LO-1 was effective in reducing the emissions of carbonaceous particulate matter.

2. Use of the 8263 allowed both units to operate for ≈ 6 months without requiring an opacity-related outage to wash the boilers. Based on the level of boiler cleanliness noted after 6 months of operation, it may be possible to further extend the period between washes.

3. Although opacity was not reduced with the use of 8263, and was at times marginal, it did not get progressively worse over time allowing the units to stay on line longer. Typically, readings at Hill 6 were 15%, ± 5%. Puna opacity readings were 15 – 25%.

HELCO
2003 OVERHAUL SCHEDULE (End Of Year)
(Rev. 1/12/04, DYM)

	Unit	Date	Weeks/Days	Description
*	Kanoelehua CT-1	Dec 30 - Mar 31	13 / 1	Starting Diesel Repair
*	Shipman No. 3	Jan 20 - Feb 10	3 / 1	Annual Overhaul, Boiler Inspection
*	Keahole CT-2	Feb 8 - 21	2 / 0	General Inspection
*	Puna	Mar 6 - 10	0 / 5	Boiler Wash
*	Shipman No. 4	Mar 10 - Apr 15	5 / 2	Boiler Inspection, Repair
*	Hill No. 5	Mar 22 - 23	0 / 2	Boiler Wash
*	HCPC	Mar 29 - 31	0 / 3	Turbine Repair
*	HEP	Apr 4 - 13	1 / 3	Steam Repair
*	Hill No. 6	Apr 14 - Jun 1	7 / 0	Boiler Inspection, Turbine Overhaul
*	Keahole D-22	May 5 - Aug 19	15 / 2	Overhaul
	Kanoelehua D-16	Jun 2 - Jan?	?	Overhaul
*	Puna	Jun 2 - 9	1 / 1	Annunciator Repair / Ash Hopper
*	Hill No. 5	Jun 7 - Jul 26	7 / 1	Boiler Inspection / Annual Overhaul
*	HEP	Jul 21 - 27	1 / 0	Semi-Annual Overhaul
*	Puna	Jul 28 - Aug 31	5 / 0	Boiler Inspection, Annual Overhaul
*	HCPC	Aug 25 - Sep 22	4 / 1	Annual Overhaul
*	Shipman No. 3	Sep 1 - 28	4 / 0	GAM Repair Work
*	Hill No. 6	Sep 23 - 27	0 / 5	Boiler Wash, Repair Work
*	HEP	Sep 29 - Oct 2	0 / 4	CT2 Hot Section
*	Shipman No. 4	Sep 29 - Nov 16	7 / 0	GAM Repair Work
*	PGV	Oct 13 - 17	0 / 5	Wellhead General Inspection
*	Puna CT-3	Oct 20 - 29	1 / 3	General Inspection
*	Puna	Nov 15 - 20	0 / 6	Boiler Wash
*	Hill No. 5	Nov 21 - 26	0 / 6	Boiler Wash

* = Actual dates

Confidential Information Deleted
Pursuant to Protective Order No. 22593.

The requested information is confidential and will be provided pursuant to Protective Order No. 22593, dated June 30, 2006. Because the requested information is voluminous, it is available for inspection at HECO's Regulatory Affairs Division office, Suite 1301, Central Pacific Plaza, 220 South King Street, Honolulu, Hawaii. Please contact Dean Matsuura at 543-4622 to make arrangements to inspect the requested information.

CA-IR-51

Ref: HELCO T-5, pages 38-41, Asset Optimization ("AO") Program.

Please provide the following documents related to the AO Program:

a. A complete copy of the maintenance assessment that was performed by EPRI Solutions for the HELCO Production Department in 2003.

b. A copy of all reports prepared by Emerson Process Controls ("EPC") for HELCO in connection with initiation and continued support of AO Program.

c. A complete and detailed statement of each of the AO Program initiatives, objectives, specific projects and planned milestones within each Phase of the Program, at inception of AO work in 2005.

d. A copy of all summary reports produced by HELCO for senior management to track performance relative to each phase of the AO Program, relative to established objectives, project schedules and milestones for each phase.

e. The anticipated annual AO Program spending by project in each year and phase of the overall Program, at the inception of the Program.

f. The actual AO Program spending by project in each phase of the Program to date, broken down between capital and expense spending on each project.

g. A detailed description of HELCO's overall status relative to each of the established AO Program objectives and milestones as of May 2006.

HELCO Response:

a. In 2003, a two-day workshop was performed by EPRI Solutions. The workshop was facilitated by HELCO's Production Maintenance Supervisor and HECO's Predictive Maintenance ("PdM") Supervisor. The purpose of the workshop was to evaluate opportunities to optimize power plant predictive maintenance processes and technologies. See Attachment 1, of this response, for a copy of the maintenance assessment. Attachment 1 is confidential and will be provided pursuant to Protective Order No. 22593.

b. HELCO contracted with the Asset Optimization Division of Emerson Process Management

(EPM). Some of the work was done by EPM's local contractor, Process Controls (PC). The reports of the EPM/PC work, and the proposals leading to that work, include:

(1) Attachment 2: EPM proposal dated June 9, 2004 for a two-phase approach for Asset Optimization services for the five steam units.

(2) Attachment 3: EPM Asset Optimization Final Project Report dated September 30, 2005, which covers Phase 1. (A copy of the Executive Summary was included in HELCO-522).

(3) Attachment 4: EPM Asset Optimization Phase One initial Project Report dated April 28, 2005. This report was deemed incomplete by HELCO management and was resubmitted by EPM as Attachment 3.

(4) Attachment 3, Appendix D: Asset Optimization Vibration Survey, January 19, 2005.

(5) Attachment 3, Appendix E: Asset Optimization PlantWeb Services Valve Survey Report (Compiled May 2005).

(6) Attachment 5: EPM's Machinery Health Reports (which are equipment vibration Survey reports); Attachment 5a, dated December 15, 2004 (the cover is erroneously labeled December 5, 2004), is the initial baseline vibration survey done as a part of Phase 1 Asset Optimization. Appendix D of the AO Phase 1 Final Report is the subsequent vibration survey, see (4) above). The following vibration surveys were produced as deliverables of Asset Optimization Phase 2: Attachment 5b, January 13, 2006; Attachment 5c, February 23, 2006; Attachment 5d, March 28, 2006; Attachment 5e, May 15, 2006; Attachment 5f, June 28, 2006; Attachment 5g, August 2, 2006; Attachment 5h, September 1, 2006; and Attachment 5i, September 21, 2006. There are some gaps in 2006 due to logistical timing issues with the scheduling of the

technician's data collection trip to Hawaii from the mainland.

(7) Attachment 6: EPM proposal dated August 18, 2005 for a Comprehensive Work Flow Process for the steam units (i.e., Phase 2).

(8) Attachment 7: EPM proposal dated August 18, 2005 to provide a Predictive Maintenance (PdM) Program.

(9) Attachment 8: Letter dated September 25, 2006, Re: Progress to date in HELCO - Emerson Workflow Project.

Attachments 2 – 4 and 6 – 8 are confidential and will be provided pursuant to Protective Order No. 22593, dated June 30, 2006. Attachments 3 and 5 are voluminous and will be available for inspection at HECO's Regulatory Affairs Division office, Suite 1301, Central Pacific Plaza, 220 South King Street, Honolulu, Hawaii. Please contact Dean Matsuura at 543-4622 to make arrangements to inspect the requested information.

c. Please refer to Attachments 2 and 3 for information regarding Asset Optimization. This program was limited to the five steam plants as they are generally older and require greater levels of maintenance. The initial presentation was in September 2004, with followup meetings and interviews with employees through October and November of 2004. This began the process of defining the equipment assets and assigning priorities to those assets, which resulted in the development of equipment criticality ratings. Additional equipment surveys involved performing extensive control valve and instrument surveys, developing route based vibration surveys, conducting control system surveys and installing a dedicated server for the Machinery Health Manager as a repository for the Puna and Hill steam turbine vibration data and route based vibration historical information. Attachment 3, Appendix E is the Control Valve Survey report developed as a followup to the System Equipment

Reliability Prioritization Process (SERP). Attachment 5 consists of the vibration reports generated from the route based predictive maintenance equipment vibration monitoring program. The final report for Asset Optimization Phase 1 (Attachment 3) was produced in September 2005. EPM's Phase 2 proposal is included in Attachment 6, and a brief progress report is in Attachment 8.

d. As indicated in subpart e, HELCO is not tracking specific projects. The reports are those provided by EPM and listed in subpart c.

e. A conceptual budget for the AO Program was put together at the inception of the Program:

	O&M Budget			Capital Budget	
Original Budget	FY04	FY05	FY06	FY05	FY06
Hill 5 Asset Optimization	$87,500	$112,500	$112,500	$262,500	$287,500
Hill 6 Asset Optimization	50,000	87,500	112,500	262,500	287,500
Shipman 3 Asset Optimization	40,000	60,000	60,000	193,000	203,000
Shipman 4 Asset Optimization	40,000	60,000	60,000	193,000	203,000
Puna Asset Optimization	45,000	50,000	50,000	200,000	200,000
Total	**$262,500**	**$370,000**	**$395,000**	**$1,111,000**	**$1,181,000**

HELCO, however, did not develop a specific project list for the Asset Optimization Program, and generally did not code projects as being part of the Asset Optimization Program.

f. Attachment 9 provides a list of Asset Optimization O&M expenses, and projects that were completed, are in-progress or planned for since 2004 to August 2006. The dollars shown for O&M were for the EPM costs associated with the Asset Optimization program, including the equipment surveys. The capital expenditures are for two projects that were specifically

coded as part of the Asset Optimization Program, as well as for projects that were not coded as part of the Asset Optimization Program, but which further the objectives of the program. Attachment 9 is confidential and will be provided pursuant to Protective Order No. 22593, dated June 30, 2006.

g. As of May 2006, Phase 1 of the Asset Optimization Program had been completed and Phase 2 was in progress. The purpose of Phase 2 is to develop a comprehensive work flow process for HELCO to aid in a better planning, and develop a disciplined and coordinated approach to overhaul work. This was initially done for the Hill 5 overhaul in May 2006. A second overhaul package was planned to be developed for the Puna overhaul in November 2006, but has been placed on hold. The plant equipment tables are being developed and uploaded into Ellipse to provide a means of tracking maintenance activities. The route based vibration analysis and thermography will aid in the development of predictive maintenance strategies. As one example of vibration analysis paying dividends, the Hill 5B boiler feed pump motor was identified to have a critical vibration signature that was indicative of a failing squirrel cage rotor bar assembly. A new motor was purchased and installed, thus preventing an extended risk condition or possible forced outage. No thermography has been performed to date due to scheduling difficulties, but is scheduled to be conducted in November 2006. The oil analysis portion of the program will be cancelled as HELCO already conducts an extensive oil sampling program using another vendor, Analysts, Inc. Asset Optimization is a broad tool to continue to emplace improvements and improve maintenance practices for the steam plants. The GAM program has aided in returning the generating plants to a level of operability that is less reactive maintenance based. However, the GAM program will eventually end. Operating the plants with less corrective maintenance requirements,

requires a level of predictive and preventative maintenance that shifts the maintenance from being reactively based. HELCO has not yet achieved this capability. The Asset Optimization program is designed to assist HELCO Production staff and personnel bring about the systemic shift that is necessary to make a predictive and preventative maintenance program successful. This effort has begun, and will eventually be expanded to encompass all HELCO generation. See discussion of predictive maintenance in HELCO T-5, pages 38 – 40.

Confidential Information Deleted
Pursuant to Protective Order No. 22593

This page intentionally left blank.

Confidential Information Deleted
Pursuant to Protective Order No. 22593

This page intentionally left blank.

Confidential Information Deleted
Pursuant to Protective Order No. 22593.

The requested information is confidential and will be provided pursuant to Protective Order No. 22593, dated June 30, 2006. Because the requested information is voluminous, it is available for inspection at HECO's Regulatory Affairs Division office, Suite 1301, Central Pacific Plaza, 220 South King Street, Honolulu, Hawaii. Please contact Dean Matsuura at 543-4622 to make arrangements to inspect the requested information.

Confidential Information Deleted
Pursuant to Protective Order No. 22593.

This page intentionally left blank.